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*The
Connecticut
Agricultural
Experiment
Station,
New Haven*

Limiting
Deer Browse
Damage to
Landscape Plants

BY JEFFREY S. WARD

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It doesn't seem all that long ago that spotting a deer was special. I remember back in the late 1960s when my mom called us to the back window. "Move slowly," she said, "there's a deer at the edge of the corn field". We all stood quietly watching for several minutes until the deer melted back into the neighboring woods.

Each year, more and more Nutmeggers have the opportunity to watch deer in their own backyards and gardens. Unfortunately, this increasingly common sight has a cost. Severe browsing by large deer herds has seriously impaired the natural regeneration of some Connecticut forests. Many a gardener knows the frustration of waking up to find prized roses, perennial plant beds, or vegetable gardens damaged by deer browse. Deer damage is not limited to plants. Over 10,000 deer have been killed by collisions with vehicles over the past five years (Kilpatrick et al. 1999). Deer are also a host species for the ticks that transmit Lyme disease (Main et al. 1981).

This Bulletin focuses on how gardeners can use plant selection in landscape design to limit or reduce browse damage by white-tailed deer (*Odocoileus virginianus*). The Introduction describes how the deer population has changed over the past hundred years in Connecticut, the impact of the increasing deer herd on the natural landscape, and the ecology and feeding patterns of white-tailed deer. The next section presents the results of a survey of Connecticut gardeners about browse damage susceptibility. Over 250 Connecticut gardeners and landscapers in 63 towns participated in this survey. They ranked deer browse damage to plants in their gardens from 0 (never damaged) to 5 (extreme, can not grow species). The results can be used by gardeners, landscapers, and others to choose plants appropriate for the number of deer in their neighborhoods.

INTRODUCTION

Deer were common in pre-colonial Connecticut and were an important source of protein and hides for Native

Americans. The herd quickly declined following European colonization. In 1648, the Legislature outlawed deer hunting, but to little avail. Deer hunting was prohibited again in 1893. Hunting to control crop damage was allowed in 1907 and sport hunting in 1957. In recent years, Connecticut has increased available permits for hunters and lengthened the hunting season to reduce the growth rate of the state's deer population, particularly in suburban areas. Nevertheless, the deer population continues to surge upward. The deer herd in Connecticut has increased from 12 at the turn of the century, to 20,000 in the late 1970s, and is now estimated to be over 76,000 (Figure 1).

Today, deer are increasingly a part of the suburban landscape in Connecticut. Deer have acclimated to both urban and suburban settings throughout the country (Conover 1995) and will continue to be a challenge for gardeners. A healthy doe in a suburbanized landscape can give birth to one or more fawns every year (Swihart et al. 1995). After accounting for natural mortality, deer herds can increase by 50% or more each year (Alexander 1980, McCullough, 1997). Deer have large overlapping home ranges of 160-500 acres (Swihart et al. 1995). Dispersal, especially male, can range upwards of several miles (Kammermeyer and Marchinton 1976). The combination of high reproductive rates, large home ranges, and wide dispersal potential can limit the temporal and spatial effectiveness of localized (neighborhood) herd control measures in reducing browse damage to landscape plants.

Deer are primarily browsers. While deer will concentrate on an abundant food source (acorns, field corn, hay fields, etc.) when available, at other times during the year they browse on a variety of vegetation (Wise 1988). Deer browse an average of 5-15 pounds of vegetation per day (Alexander 1980). Their normal diet consists of leaves, twigs, forbs, acorns, lichens, and fruit. Suburban deer will preferentially browse on ornamental species rather than native plants (Swihart et al 1995). Forests with deer densities exceeding 20 deer/mile² will have little, if any, natural regeneration (Behrend et al. 1970, Tilghman 1989). At higher densities, a

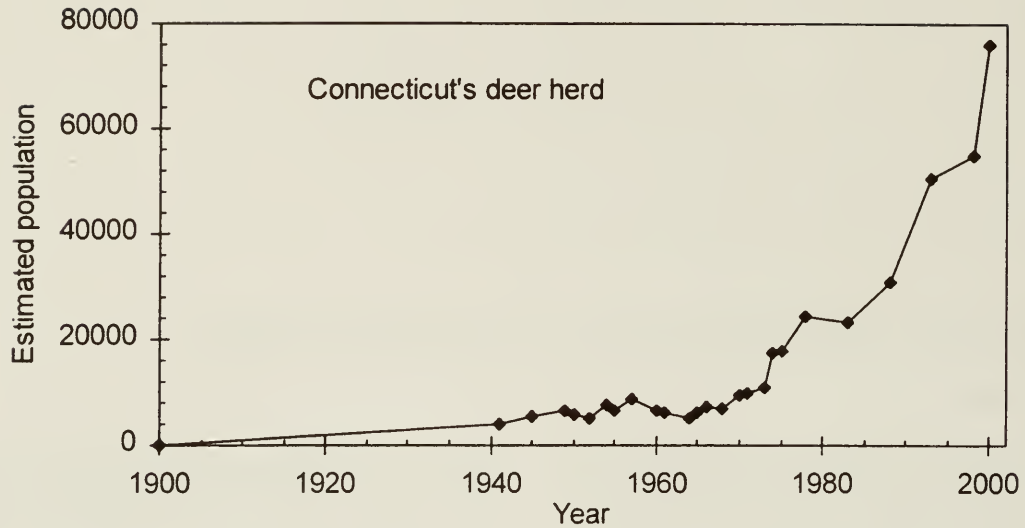


Figure 1. Estimated deer population in Connecticut (compiled from Herig 1974, Anon. 1985, Kilpatrick 1999, Gregonis 2000).

browse line may develop where all palatable plant parts within six feet of the ground are eaten. Under starvation conditions deer begin to strip bark off small trees and branches.

Browse damage by large deer herds is a problem throughout much of the United States, including Connecticut (Conover 1995). The problem can be especially acute in, or near, parks and natural areas where hunting is prohibited. Forest understories have become dominated by browse resistant species such as hophornbeam, blue beech and striped maple along with exotic invasives such as Japanese barberry, ailanthus, oriental bittersweet, and winged euonymus. Unfortunately, these browse resistant species often have lower economic, aesthetic, and wildlife values than the species they displace. The damage caused by browsing is not limited to trees. At least 98 threatened or endangered plants are browsed by white-tailed deer (Miller et al. 1992a). Many spring wildflowers (lilies, trilliums, orchids, lobelias, and buttercups) and flowering shrubs (dogwoods, viburnums, roses, and rhododendrons) are favored by deer. Change in forest structure caused by deer browse can have a negative impact on bird species that nest in the understory (McShea and Rappole 1997).

Severe deer browse has fostered groundcovers dominated by ferns, grasses, and unpalatable tree species in some forests (Miller et al. 1992a, Strole and Anderson 1992, Rooney and Dress 1997). Understories dominated by hophornbeam, blue beech, striped maple, and barberry are good indicators of severe browse pressure. Severe browsing also reduces natural regeneration of desired species (e.g.,

oak, maple, pine) needed to replace harvested or dead trees. In areas where eastern hemlock is threatened by hemlock woolly adelgid, replanting with other conifers would be futile unless the seedlings are given some protection from browsing (Ward et al. 2000).

There are five strategies for reducing deer browse damage to landscape plants: herd control, psychological, repellents, physical barriers, and plant selection. This Bulletin focuses on choosing plants that are appropriate for the level of browse damage in your neighborhood. The effectiveness of this strategy will depend on your tolerance of deer browse damage, local deer density, their feeding habits, and availability of food in the neighborhood and the surrounding woods. Which species are browsed, and the amount of browse damage, will vary from year to year, and from neighborhood to neighborhood.

DEER BROWSE DAMAGE SURVEY

Over the past two years, 269 Connecticut gardeners in 63 towns have participated in a survey of deer browse damage. An analysis of the surveys shows that gardens and landscape plants of most respondents have been impacted by deer. The average gardener reported growing 66 species of landscape plants (range 1-247). Most gardeners (97%) who completed the survey have had some browse damage to their landscape plants. Eighty-eight percent of gardeners noted browse damage to both their shrubs and herbaceous plants. Fully 95% of respondents have observed one or more deer on their property.

Table 1. Landscape species that Connecticut gardeners have discontinued growing because of extreme deer browse damage.

| >20% of gardeners | | |
|---------------------------------------|---|---|
| Tulip (<i>Tulipa</i>) | Yew (<i>Taxus</i>) | Golden sunflower (<i>Heliopsis</i>) |
| Foxtail lilies (<i>Eremurus</i>) | Perennial sunflower (<i>Helianthus</i>) | Lilies (<i>Lilium</i>) |
| Hosta (<i>Hosta</i>) | | |
| 15-19% of gardeners | | |
| Daylily (<i>Hemerocallis</i>) | Euonymus (<i>Euonymus</i>) | Arborvitae (<i>Thuja</i>) |
| Bolton's aster (<i>Boltonia</i>) | Annual sunflower (<i>Helianthus</i>) | Miniature hollycocks (<i>Sidalcea</i>) |
| Impatiens (<i>Impatiens</i>) | Phlox, garden or summer (<i>Phlox paniculata</i>) | |
| 10-14% of gardeners | | |
| Hibiscus (<i>Hibiscus</i>) | Caladium (<i>Caladium</i>) | Lupine (<i>Lupinus</i>) |
| Canna (<i>Canna</i>) | Painted daisy (<i>Pyrethrum</i>) | Dahlia (<i>Dahlia</i>) |
| Rose mallow (<i>Malva</i>) | Flax (<i>Linum</i>) | English daisy (<i>Bellis</i>) |
| Galdiulus (<i>Galdiulus</i>) | Turtlehead (<i>Chelone</i>) | Hollyhock (<i>Alcea</i>) |
| Black-eyed Susan (<i>Rudbeckia</i>) | Shasta daisy (<i>Leucanthemum</i>) | Yucca (<i>Yucca</i>) |
| Candytuft (<i>Iberis</i>) | Coneflower (<i>Echinacea</i>) | Azalea, deciduous (<i>Rhododendron</i>) |

As part of the survey, gardeners noted which species had, and had not, been browsed in their gardens. This provided an estimate of the frequency of browse damage. For example, 132 of 195 gardeners (68%) who grew impatiens (*Impatiens wallerana*) noted some browse damage. In contrast, only 3 of 62 gardeners (5%) noted browse damage on catnip (*Nepeta cataria*). Frequency of browse damage ranged from 0% for poison ivy (*Rhus radicans*) and birch (*Betula* spp.) to a high of 90% of hosta (*Hosta* spp.).

Gardeners then recorded the amount of browse damage (severity) to plants that had been browsed. Severity was noted on a scale from 0-5: 0-no damage, 1-light damage (rarely noticed), 2-moderate damage (noticeable but tolerable), 3-heavy damage (growth and floral display affected), 4-severe damage (some plants have to be replaced), and 5-extreme (cannot grow species). Of those species that had been browsed, severity ranged from 1 (light damage) for oak (*Quercus* spp.), winter aconite (*Eranthis* spp.), and kerria (*Kerria japonica*) to 4.3 (severe) for tulip (*Tulipa* spp.).

The relationship between browse frequency and severity is shown in Figure 2. As might be expected, frequency and severity were highly correlated ($r=0.601$, $\chi^2=93.9$, $p<0.001$). Species that were frequently browsed (> 60%), such as daylilies (*Hemerocallis* spp.), had moderately heavy to severe damage when browsed. Light damage was noted on species that were infrequently browsed, such as lavender (*Lavandula angustifolia*) and thyme (*Thymus* spp.).

Browse damage can cause a shift in the type and number of landscape species that are grown. In general, more species were grown in gardens that had low browsing frequency than in gardens where most species had some browse damage (Fig. 3). There were 229 respondents who reported

growing at least 10 species of landscape plants. Of these, 134 had stopped growing at least one species because of deer browse damage (Table 1). Gardeners who have reported extreme browse damage have discontinued growing an average of 5.6 species (range 1-34 species). Over half of the gardeners who completed the survey have stopped growing tulips because of browse damage. In addition, one-fifth of gardeners who had grown yew (*Taxus* spp.), perennial sunflowers (*Helianthus x multiflorus*), foxtails lilies (*Eremurus*), lilies (*Lilium*), and hosta no longer do so because of extreme deer browse damage.

SELECTING PLANTS

No species is completely immune to browse damage. This is exemplified by daffodils (*Narcissus* spp.). Daffodils are listed as highly resistant to deer browse damage (Horton and Edge 1994, Tilt et al. 1996, Kays et al. 1997). However, 15% of gardeners in this survey reported at least some browse damage, albeit light, to their daffodils. This damage was probably caused by fawns that had not yet learned that daffodils were unpalatable because of calcium oxylate crystals and toxic alkaloids (Foster and Caras 1994).

An index of browse damage susceptibility was calculated for each species using both the frequency and severity of browsing using:

$$\text{Index of browse damage susceptibility} = 100 * \text{frequency} * \text{severity}.$$

High index values indicate species susceptible to browse damage. Species that are resistant to browse damage have low index values. If you are starting a new garden, or are uncertain about browse damage in your neighborhood, use the following general guide. Plants with index values over

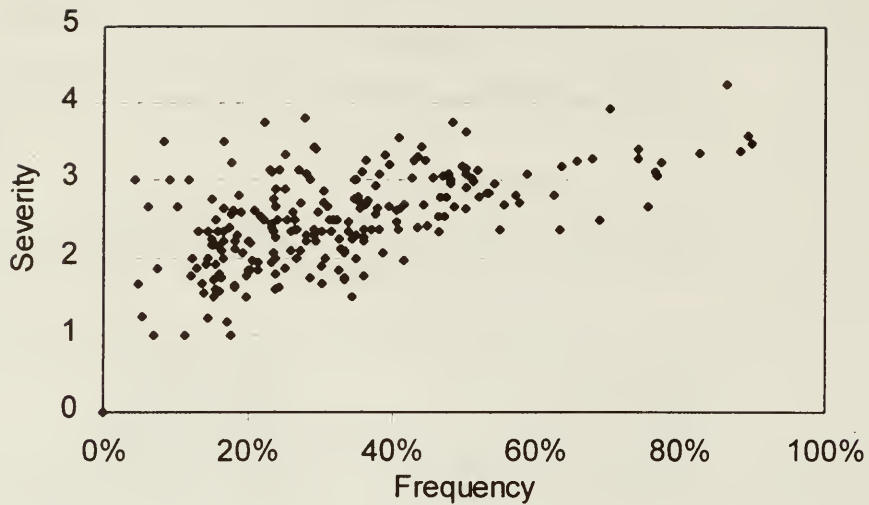


Figure 2. The relationship between browse damage severity and frequency for 224 landscape species in Connecticut. Browse severity ranges from 0 (no damage) to 5 (cannot grow plants). Frequency (%) is the proportion of gardeners who observed browse damage to a species in their garden.

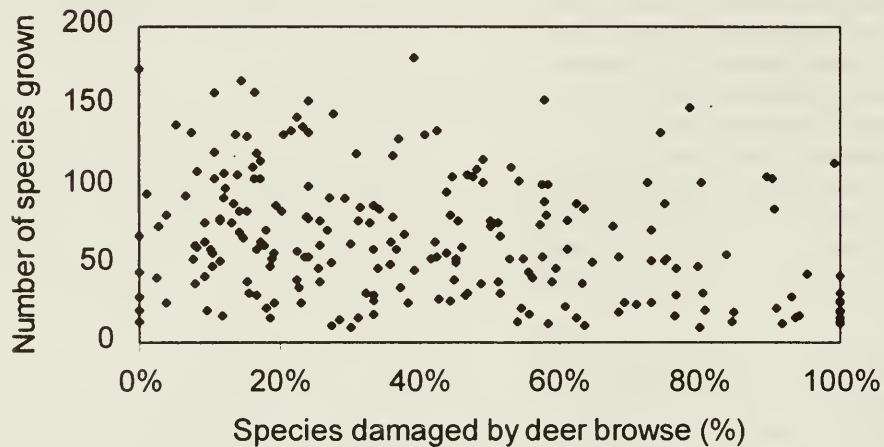


Figure 3. The relationship between the number of landscape species grown and the proportion of species damaged by deer browse for 229 gardeners in Connecticut. Only gardeners who grew at least ten species are shown.

Table 2. Plants that were found to be resistant to deer browse damage by a survey of Connecticut gardeners. These plants are appropriate for areas where moderate browse damage may be expected. Plants are listed by common name with genus in parentheses.

Annuals and perennials grown as annuals

| | | |
|--------------------------------|------------------------------|-----------------------------------|
| Spiderflower (<i>Cleome</i>) | Marigold (<i>Tagetes</i>) | Forget-me-not (<i>Myosotis</i>) |
| Vinca (<i>Catharanthus</i>) | Alyssum (<i>Lobularia</i>) | Dusty miller (<i>Senecio</i>) |

Groundcovers

| | | |
|----------------------------|----------------------------------|------------------------------------|
| Myrtle (<i>Vinca</i>) | Dead nettle (<i>Lamium</i>) | Pachysandra (<i>Pachysandra</i>) |
| Bugleweed (<i>Ajuga</i>) | Sweet woodruff (<i>Galium</i>) | Wild ginger (<i>Asarum</i>) |

Bulbs and corms

| | | |
|-------------------------------------|---|-------------------------------|
| Hen & chicks (<i>Sempervivum</i>) | Star of Bethlehem (<i>Ornithogalum</i>) | Snowdrop (<i>Galanthus</i>) |
| Ornamental chives (<i>Allium</i>) | Daffodil (<i>Narcissus</i>) | |

Herbaceous perennials

| | | |
|---|---------------------------------|----------------------------------|
| Lily of the valley (<i>Convallaria</i>) | Lamb's ears (<i>Stachys</i>) | Lavender (<i>Lavandula</i>) |
| Yarrow (<i>Achillea</i>) | Foxglove (<i>Digitalis</i>) | Mint (<i>Mentha</i>) |
| Russian sage (<i>Perovskia</i>) | Oregano (<i>Origanum</i>) | Silvermound (<i>Artemisia</i>) |
| Lady's mantle (<i>Alchemilla</i>) | Thyme (<i>Thymus</i>) | Poppy (<i>Papaver</i>) |
| Catmint (<i>Nepeta</i>) | Goldenrod (<i>Solidago</i>) | Rubarb (<i>Rheum</i>) |
| Monkshood (<i>Aconitum</i>) | Mayapple (<i>Podophyllum</i>) | |

Vines

| | | |
|----------------------------------|------------------------------|--|
| Bittersweet (<i>Celastrus</i>) | Wisteria (<i>Wisteria</i>) | Virginia creeper (<i>Parthenocissus</i>) |
|----------------------------------|------------------------------|--|

Shrubs and trees

| | | |
|------------------------------------|---|------------------------------|
| Leucothoe (<i>Leucothoe</i>) | Flowering quince (<i>Chaenomeles</i>) | Weigela (<i>Weigela</i>) |
| Butterfly bush (<i>Buddleia</i>) | Deutzia (<i>Deutzia</i>) | Spruce (<i>Picea</i>) |
| Cotoneaster (<i>Cotoneaster</i>) | Boxwood (<i>Buxus</i>) | Spiraea (<i>Spiraea</i>) |
| Honeysuckle (<i>Lonicera</i>) | Heather (<i>Calluna</i>) | Barberry (<i>Berberis</i>) |
| Goldenbells (<i>Forsythia</i>) | Andromeda (<i>Pieris</i>) | |

Table 3. Plants that were found to be very susceptible to deer browse damage by a survey of Connecticut gardeners. These plants are not likely to survive in areas where deer browse damage is expected. Plants are listed by common name with genus in parentheses.

Annuals and perennials grown as annuals

| | | |
|--------------------------------|------------------------------------|---------------------------------|
| Impatiens (<i>Impatiens</i>) | Sunflower (<i>Helianthus</i>) | English daisy (<i>Bellis</i>) |
| Dahlia (<i>Dahlia</i>) | Fibrous begonia (<i>Begonia</i>) | |

Bulbs and corms

| | | |
|---|---------------------------------|--------------------------|
| Tulip (<i>Tulipa</i>) | Daylily (<i>Hemerocallis</i>) | Lilies (<i>Lilium</i>) |
| Spring-flowering crocus (<i>Crocus</i>) | | |

Herbaceous perennials

| | | |
|------------------------------------|---------------------------------------|---|
| Hosta (<i>Hosta</i>) | Garden phlox (<i>P. paniculata</i>) | Hollyhock (<i>Alcea</i>) |
| Daisy (<i>Chrysanthemum</i>) | Black-eyed Susan (<i>Rudbeckia</i>) | Jerusalem artichoke (<i>Helianthus</i>) |
| Candytuft (<i>Iberis</i>) | Shasta daisy (<i>Leucanthemum</i>) | Coneflower (<i>Echinacea</i>) |
| Cardinal flower (<i>Lobelia</i>) | Hibiscus (<i>Hibiscus</i>) | Rose mallow (<i>Malva</i>) |

Shrubs and trees

| | | |
|--|--------------------------------------|--|
| Yew (<i>Taxus</i>) | Euonymus (<i>Euonymus</i>) | Arborvitae (<i>Thuja</i>) |
| Deciduous azalea (<i>Rhododendron</i>) | Rhododendron (<i>Rhododendron</i>) | Evergreen azalea (<i>Rhododendron</i>) |
| Rose (<i>Rosa</i>) | Hydrangea (<i>Hydrangea</i>) | American holly (<i>Ilex</i>) |
| Evergreen holly (<i>Ilex</i>) | Yucca (<i>Yucca</i>) | Eastern red cedar (<i>Juniperus</i>) |
| Juniper (<i>Juniperus</i>) | Mountain laurel (<i>Kalmia</i>) | Hemlock (<i>Tsuga</i>) |

200 will probably suffer severe-to-extreme browse damage if deer are browsing plants on other properties in the neighborhood. Plants with index values between 100-200 will likely suffer heavy-to-severe browse damage; index values between 50-100 indicate plants may occasionally be damaged; and plants with index values < 50 are unlikely to be damaged by deer browsing. A simplified summary of this study is provided to help you choose plants for your garden. Browse resistant species (low index values) are in Table 2. Species that are susceptible to browse damage (high index values) are in Table 3.

More comprehensive guides with 256 landscape species can be found in Tables 4 – 9. Plants are grouped into general growth types. Table 4 lists annuals and perennials grown as annuals in Connecticut. Table 5 lists groundcovers and Table 6 lists bulbs and corms. Herbaceous perennials are listed in Table 7. Table 8 lists vines and Table 9 lists shrubs and small trees. In each table, plants that are most susceptible to browse damage are found at the beginning of the list, and plants that are resistant to browse damage are found at the end of the list.

To use the comprehensive guides it is important to determine the degree of browse damage to landscape plants in your neighborhood. The first step is to note which plants in your garden are lightly or occasionally browsed, i.e., occasional nibbling here and there. Where possible, scout for browse damage in your neighborhood, especially on plants that you are considering adding to your landscape. Discovering which species have light browse damage will allow you to determine the browse pressure in your neighborhood.

The next step is to find those plants that are lightly or occasionally browsed in your neighborhood on one of the lists (Tables 4-9). Note the index values for each species. Lastly, choose plants with a similar or lower index value for your garden.

I will use the gardens of May Flores (a hypothetical gardener) as an example. The numbers in parentheses are the index value for each species. She observed that deer destroyed her tulips (368) and hosta (314), and caused moderate damage to her crocus (142), hollyhocks (158), and foundation junipers (149). Damage to her viburnums (98), gayfeathers (100), and larkspurs (87) was light (acceptable). This indicates that she should select plants with index values

less than 100 (e.g., nasturtiums, pachysandra, fritillary, primrose, etc.). These plants should experience little or light damage in her garden. There are no guarantees against browse damage (deer are unpredictable), but choosing resistant plants will increase the odds that deer will not cause extensive damage to the shrubs and flowers in your landscape.

OTHER HINTS

There are other steps you can take to reduce deer browse damage. Plant the most browse resistant plants along the edge of your property or where deer access your property (Table 2). This will help deter deer from including your landscape as part of their feeding territory. Plants that are highly susceptible to deer browse (Table 3) should be planted close to the most commonly used door, intermingled with browse resistant plants, or grown within a small fenced area (Lee 1998, Miller et al. 1992b).

Research at The Connecticut Agricultural Experiment Station and elsewhere has shown that repellents can reduce deer browsing in orchards, nurseries, and Christmas tree plantations (Swihart and Conover 1988, Manson 1997). Plastic flagging or metal pie pans attached to treated foliage can increase the effectiveness of a repellent (Campbell and Evans 1987). Repellents may be sufficient to lower browse damage to an acceptable level. The relative effectiveness of repellents varied among studies and plant species (Swihart and Conover 1988, El Hani and Conover 1995, Lutz and Swanson 1995, Anon. 1998). For example, Anon. (1998) recommended Hinder as the most effective and inexpensive product. However, Lutz and Swanson (1995) ranked Hinder average in effectiveness. More information of using repellents can be found in Manson (1997).

ACKNOWLEDGEMENTS

This work would not have been possible without the gardeners of Connecticut who participated in the browse survey. A special thanks to the Federated Garden Clubs of Connecticut, the Wilton Garden Club, and Ms. Margaret Boehm for their assistance.

Table 4. Annuals and perennials grown as annuals in Connecticut listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage Index | % | Avg. | N |
|-------------------------|--------------|------------------------|-----|------|-----|
| Impatiens | Impatiens | 223 | 68% | 3.3 | 195 |
| Sunflower | Helianthus | 181 | 48% | 3.8 | 83 |
| English daisy | Bellis | 180 | 59% | 3.1 | 46 |
| Dahlia | Dahlia | 159 | 54% | 3.0 | 74 |
| Fibrous begonia | Begonia | 155 | 51% | 3.0 | 49 |
| Tuberous begonia | Begonia | 151 | 53% | 2.8 | 47 |
| Caladium | Caladium | 145 | 41% | 3.6 | 22 |
| Zinnias | Zinnias | 138 | 46% | 3.0 | 81 |
| Aster | Callistephus | 131 | 50% | 2.6 | 70 |
| Galdiolus | Galdiolus | 126 | 39% | 3.2 | 38 |
| Geranium | Pelargonium | 119 | 44% | 2.7 | 133 |
| Flowering kale, cabbage | Brassica | 118 | 36% | 3.3 | 33 |
| Coleus | Coleus | 118 | 46% | 2.5 | 56 |
| Petunia | Petunia | 105 | 40% | 2.7 | 81 |
| Cosmos | Cosmos | 100 | 38% | 2.6 | 79 |
| Canna | Canna | 100 | 29% | 3.4 | 24 |
| Morning glory | Ipomoea | 96 | 35% | 2.7 | 54 |
| Pinks, Sweet William | Dianthus | 88 | 37% | 2.4 | 73 |
| Larkspur | Consolida | 87 | 30% | 2.9 | 23 |
| Moss rose | Portulaca | 86 | 29% | 3.0 | 28 |
| Nasturtium | Tropaeolum | 85 | 27% | 3.1 | 52 |
| Pansy | Viola | 82 | 31% | 2.7 | 113 |
| Snapdragons | Antirrhinum | 80 | 39% | 2.1 | 83 |
| Lobelia | Lobelia | 79 | 32% | 2.5 | 66 |
| Globe amaranth | Gomphrena | 70 | 35% | 2.0 | 20 |
| Verbena | Verbena | 69 | 33% | 2.1 | 52 |
| Salvia | Salvia | 65 | 29% | 2.2 | 92 |
| Cockscomb | Celosia | 64 | 28% | 2.3 | 25 |
| Blue floss flower | Ageratum | 59 | 32% | 1.8 | 37 |
| Spiderflower | Cleome | 55 | 22% | 2.5 | 51 |
| Marigold | Tagetes | 47 | 18% | 2.6 | 101 |
| Forget-me-not | Myosotis | 45 | 23% | 1.9 | 69 |
| Vinca | Catharanthus | 38 | 24% | 1.6 | 84 |
| Alyssum | Lobularia | 30 | 20% | 1.5 | 61 |
| Dusty miller | Senecio | 22 | 14% | 1.5 | 79 |

Table 5. Groundcovers suitable for Connecticut listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | Avg. | N |
|--------------------|-------------|---------------|-----|------|-----|
| | | Index | % | | |
| Ground ivy | Hedera | 118 | 38% | 3.1 | 84 |
| Thrift, seapine | Armeria | 105 | 35% | 3.0 | 20 |
| Myrtle, periwinkle | Vinca | 45 | 20% | 2.2 | 128 |
| Dead nettle | Lamium | 44 | 17% | 2.6 | 48 |
| Pachysandra | Pachysandra | 41 | 21% | 1.9 | 150 |
| Wild ginger | Asarum | 39 | 18% | 2.1 | 44 |
| Bugleweed | Ajuga | 34 | 16% | 2.1 | 61 |
| Sweet woodruff | Galium | 25 | 12% | 2.0 | 65 |

Table 6. Bulbs and corms suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | Avg. | N |
|-------------------------|--------------|---------------|-----|------|-----|
| | | Index | % | | |
| Tulip | Tulipa | 368 | 86% | 4.3 | 183 |
| Daylily | Hemerocallis | 298 | 88% | 3.4 | 204 |
| Lilies | Lilium | 277 | 83% | 3.3 | 149 |
| Spring-flowering crocus | Crocus | 142 | 48% | 3.0 | 129 |
| Wood hyacinth | Endymion | 104 | 35% | 3.0 | 55 |
| Hyacinth | Hyacinthus | 100 | 41% | 2.5 | 96 |
| Trout lily | Erythronium | 90 | 38% | 2.4 | 42 |
| Iris (rhizome) | Iris | 85 | 36% | 2.4 | 133 |
| Iris (bulbs) | Iris | 83 | 34% | 2.5 | 121 |
| Autumn-flowering crocus | Crocus | 83 | 25% | 3.3 | 24 |
| Grape hyacinth | Muscari | 82 | 36% | 2.3 | 103 |
| Fritillaria | Fritillaria | 80 | 36% | 2.2 | 25 |
| Siberian squil | Scilla | 68 | 24% | 2.9 | 38 |
| Glory-of-the-snow | Chionodoxa | 66 | 26% | 2.5 | 38 |
| Autumn crocus | Colchicum | 58 | 17% | 3.5 | 24 |
| Hen & chicks | Sempervivum | 52 | 19% | 2.8 | 86 |
| Snowflake | Leucojum | 47 | 13% | 3.5 | 15 |
| Star of Bethlehem | Ornithogalum | 45 | 18% | 2.6 | 40 |
| Snowdrop | Galanthus | 29 | 15% | 1.9 | 78 |
| Ornamental chives | Allium | 27 | 14% | 1.9 | 85 |
| Daffodil | Narcissus | 23 | 15% | 1.5 | 198 |

Table 7. Herbaceous perennials suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | | |
|--------------------------|---------------|---------------|-----|------|-----|
| | | Index | % | Avg. | N |
| Hosta | Hosta | 314 | 90% | 3.5 | 216 |
| Golden sunflower | Heliopsis | 275 | 70% | 3.9 | 20 |
| Phlox, garden/ summer | P. paniculata | 243 | 74% | 3.3 | 54 |
| Turtlehead | Chelone | 214 | 66% | 3.3 | 29 |
| Sunflower, perennial | Helianthus | 182 | 50% | 3.6 | 38 |
| Candytuft | Iberis | 161 | 52% | 3.1 | 62 |
| Hollyhock | Alcea | 158 | 50% | 3.2 | 60 |
| Daisy | Chrysanthemum | 158 | 50% | 3.2 | 105 |
| Black-eyed Susan | Rudbeckia | 154 | 50% | 3.1 | 102 |
| Shasta daisy | Leucanthemum | 152 | 51% | 3.0 | 92 |
| Coneflower | Echinacea | 147 | 48% | 3.1 | 105 |
| Stonecrop | Aethionema | 146 | 50% | 2.9 | 24 |
| Hibiscus | Hibiscus | 144 | 44% | 3.3 | 36 |
| Cardinal flower | Lobelia | 144 | 47% | 3.1 | 34 |
| Bolton's aster | Boltonia | 144 | 48% | 3.0 | 25 |
| Rose mallow | Malva | 143 | 43% | 3.3 | 53 |
| Stokes' aster | Stokesia | 139 | 43% | 3.3 | 28 |
| Aster | Aster | 133 | 48% | 2.8 | 82 |
| Joe Pye weed | Eupatorium | 130 | 49% | 2.7 | 37 |
| Lupine | Lupinus | 130 | 39% | 3.3 | 54 |
| Balloonflower | Platycodon | 129 | 43% | 3.0 | 68 |
| Solomon's seal | Polygonatum | 129 | 47% | 2.8 | 58 |
| Stonecrop | Sedum | 111 | 42% | 2.7 | 53 |
| Blanketflower | Gaillardia | 111 | 36% | 3.1 | 28 |
| Larkspur | Delphinium | 110 | 38% | 2.9 | 40 |
| Phlox, creeping | Phlox | 108 | 41% | 2.6 | 100 |
| Bellflower | Campanula | 106 | 41% | 2.6 | 69 |
| Pasqueflower, snowdrop | Anemone | 106 | 28% | 3.8 | 18 |
| Blazing star, gayfeather | Liatris | 100 | 37% | 2.7 | 41 |
| Gentian | Gentiana | 100 | 29% | 3.4 | 17 |
| Butterfly weed | Asclepias | 98 | 35% | 2.8 | 51 |
| Marsh marigold | Caltha | 96 | 41% | 2.4 | 27 |
| Bugbane, Fairy candles | Cimicifuga | 96 | 35% | 2.8 | 23 |
| False indigo | Baptisia | 94 | 35% | 2.6 | 31 |
| Obedient plant | Physostegia | 86 | 28% | 3.1 | 43 |
| Flax | Linum | 83 | 22% | 3.8 | 18 |
| Speedwell | Veronica | 83 | 30% | 2.7 | 46 |
| Meadow rue | Thalictrum | 81 | 32% | 2.5 | 31 |
| Primrose | Primula | 77 | 31% | 2.5 | 74 |
| Corallbells | Heuchera | 77 | 30% | 2.6 | 98 |
| Yellow bleeding heart | Corydalis | 76 | 24% | 3.1 | 29 |
| Violet | Viola | 73 | 31% | 2.3 | 105 |
| Virginia Bluebell | Mertensia | 73 | 32% | 2.3 | 37 |
| Bloodroot | Sanguinaria | 72 | 23% | 3.1 | 39 |
| Pincushion flower | Scabiosa | 71 | 23% | 3.1 | 35 |
| Goatsbeard | Aruncus | 70 | 33% | 2.1 | 30 |
| Spiderwort | Tradescantia | 70 | 30% | 2.3 | 40 |
| Lungwort | Pulmonaria | 69 | 33% | 2.1 | 51 |
| Evening primrose | Oenothera | 68 | 29% | 2.4 | 76 |

Table 7. Herbaceous perennials suitable for Connecticut gardens listed from most to least susceptible to browse damage (continued). Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | Avg. | N |
|----------------------|-------------|---------------|-----|------|-----|
| | | Index | % | | |
| Cranesbill | Geranium | 68 | 26% | 2.6 | 65 |
| False Solomon's seal | Smilacina | 63 | 27% | 2.4 | 30 |
| Bachelor buttons | Centaurea | 63 | 24% | 2.7 | 38 |
| Beebalm | Monarda | 63 | 25% | 2.5 | 103 |
| Columbine | Aquilegia | 62 | 28% | 2.2 | 114 |
| Purple loosestrife | Lythrum | 62 | 31% | 2.0 | 26 |
| Peony | Paeonia | 60 | 26% | 2.3 | 124 |
| Celandine poppy | Stylophorum | 60 | 24% | 2.5 | 25 |
| Baby's breath | Gypsophila | 57 | 18% | 3.2 | 51 |
| Meadow sage | Salvia | 57 | 30% | 1.9 | 30 |
| Loosestrife | Lysimachia | 56 | 23% | 2.4 | 39 |
| Red-hot poker | Kniphofia | 56 | 22% | 2.5 | 18 |
| Carnation, pinks | Dianthus | 55 | 23% | 2.3 | 64 |
| Comfrey | Symphytum | 54 | 21% | 2.6 | 24 |
| Bleeding heart | Dicentra | 54 | 26% | 2.1 | 139 |
| False spirea | Astilbe | 54 | 26% | 2.1 | 89 |
| Jacob's ladder | Polemonium | 53 | 27% | 2.0 | 90 |
| Foamflower | Tiarella | 52 | 34% | 1.5 | 29 |
| Lenten rose | Helleborus | 50 | 29% | 1.8 | 28 |
| Tickseed | Coreopsis | 49 | 19% | 2.6 | 63 |
| Monkshood | Aconitum | 44 | 20% | 2.2 | 45 |
| Foxglove | Digitalis | 42 | 18% | 2.3 | 98 |
| Globe thistle | Echinops | 41 | 15% | 2.8 | 54 |
| Yarrow | Achillea | 40 | 21% | 2.0 | 112 |
| Ragged robin | Lychnis | 39 | 21% | 1.8 | 28 |
| Silvermound | Artemisia | 37 | 20% | 1.8 | 89 |
| Lady's mantle | Alchemilla | 37 | 17% | 2.2 | 84 |
| Basket of gold | Aurinia | 37 | 16% | 2.3 | 19 |
| Russian sage | Perovskia | 35 | 20% | 1.8 | 91 |
| Rue | Ruta | 33 | 15% | 2.3 | 27 |
| Betony, Lamb's ears | Stachys | 33 | 15% | 2.2 | 117 |
| Snow-on-mountain | Euphorbia | 30 | 13% | 2.3 | 23 |
| Lily of the valley | Convallaria | 30 | 18% | 1.7 | 126 |
| Lavender | Lavandula | 30 | 18% | 1.6 | 115 |
| Mayapple | Podophyllum | 29 | 16% | 1.8 | 31 |
| Snow-in-summer | Cerastium | 29 | 14% | 2.0 | 28 |
| Rhubarb | Rheum | 26 | 15% | 1.7 | 46 |
| Poppy | Papaver | 25 | 15% | 1.6 | 65 |
| Goldenrod | Solidago | 24 | 13% | 1.9 | 55 |
| Costmary, tansy | Tanacetum | 23 | 14% | 1.7 | 22 |
| Oregano, marjoram | Origanum | 18 | 14% | 1.2 | 90 |
| Lemon balm | Melissia | 16 | 6% | 2.7 | 49 |
| Mint | Mentha | 14 | 8% | 1.9 | 93 |
| Trillium | Trillium | 13 | 4% | 3.0 | 23 |
| Catmint | Nepeta | 8 | 5% | 1.7 | 62 |
| Thyme | Thymus | 7 | 5% | 1.3 | 76 |

Table 8. Vines suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | Avg. | N |
|------------------|----------------|---------------|-----|------|-----|
| | | Index | % | | |
| Clematis | Clematis | 74 | 27% | 2.7 | 103 |
| Trumpet creeper | Campsis | 48 | 24% | 2.0 | 21 |
| Bittersweet | Celastrus | 40 | 18% | 2.2 | 50 |
| Wisteria | Wisteria | 33 | 15% | 2.2 | 40 |
| Virginia creeper | Parthenocissus | 20 | 17% | 1.2 | 35 |
| Poison ivy | Rhus radicans | 0 | 0% | 0.0 | 28 |

Table 9. Shrubs and trees suitable for Connecticut gardens listed from most to least susceptible to browse damage. Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | Avg. | N |
|------------------------|---------------|---------------|-----|------|-----|
| | | Index | % | | |
| Yew | Taxus | 320 | 89% | 3.6 | 150 |
| Euonymus | Euonymus | 252 | 74% | 3.4 | 50 |
| Arborvitae | Thuja | 250 | 77% | 3.2 | 101 |
| Azalea, deciduous | Rhododendron | 239 | 77% | 3.1 | 98 |
| Rhododendron | Rhododendron | 236 | 77% | 3.1 | 134 |
| Azalea, evergreen | Rhododendron | 202 | 63% | 3.2 | 189 |
| Rose | Rosa | 201 | 75% | 2.7 | 146 |
| Hydrangea | Hydrangea | 176 | 63% | 2.8 | 144 |
| American holly | Ilex | 171 | 69% | 2.5 | 48 |
| Holly, deciduous | Ilex | 161 | 57% | 2.8 | 28 |
| Holly, evergreen | Ilex | 157 | 58% | 2.7 | 125 |
| Yucca | Yucca | 151 | 44% | 3.4 | 41 |
| Eastern red cedar | Juniperus | 151 | 53% | 2.8 | 45 |
| Mountain laurel | Kalmia | 149 | 56% | 2.7 | 162 |
| Juniper, shrub | Juniperus | 149 | 63% | 2.4 | 133 |
| Hemlock | Tsuga | 144 | 52% | 2.8 | 104 |
| Willow | Salix | 130 | 55% | 2.4 | 20 |
| Rose of Sharon | Hibiscus | 120 | 47% | 2.5 | 70 |
| Crabapple, apple | Malus | 109 | 46% | 2.3 | 56 |
| Burning bush | Euonymus | 108 | 45% | 2.4 | 183 |
| Daphne | Daphne | 104 | 43% | 2.4 | 23 |
| Viburnum | Viburnum | 98 | 36% | 2.7 | 88 |
| Summersweet | Clethra | 96 | 38% | 2.6 | 24 |
| Dogwood, bunchberry | Cornus | 81 | 42% | 2.0 | 53 |
| Pine | Pinus | 80 | 34% | 2.3 | 103 |
| Mockorange | Philadelphus | 77 | 34% | 2.3 | 35 |
| Smoke Bush | Cotinus | 73 | 27% | 2.8 | 15 |
| Firethorn, cotoneaster | Pyracantha | 72 | 25% | 2.9 | 36 |
| Witch hazel | Hamamelis | 67 | 29% | 2.3 | 24 |
| Blueberry, cranberry | Vaccinium | 64 | 36% | 1.8 | 25 |
| Lilac | Syringa | 62 | 26% | 2.4 | 137 |
| Leucothoe | Leucothoe | 58 | 33% | 1.7 | 81 |
| Flowering almond | P. glandulosa | 57 | 33% | 1.7 | 21 |

Table 9. Shrubs and trees suitable for Connecticut gardens listed from most to least susceptible to browse damage (Continued). Index is a composite of percent of respondents reporting damage for that species (%) and average damage when there was browsing (Avg.): 0=No damage, 1=Light damage (<10%), 2=Moderate damage (10-25%), 3=Heavy damage (25-50%), 4=Severe damage (50-75%), and 5=Extreme, can't grow plants. N is the number of respondents for each species.

| Common name | Genus | Browse damage | | Avg. | N |
|------------------|-------------|---------------|-----|------|-----|
| | | Index | % | | |
| Flowering quince | Chaenomeles | 57 | 27% | 2.1 | 44 |
| Weigela | Weigela | 56 | 23% | 2.4 | 43 |
| Butterfly bush | Buddleia | 54 | 24% | 2.3 | 93 |
| Deutzia | Deutzia | 50 | 30% | 1.7 | 30 |
| Spruce | Picea | 48 | 23% | 2.1 | 77 |
| Cotoneaster | Cotoneaster | 47 | 25% | 1.9 | 64 |
| Shadbush | Amelanchier | 43 | 24% | 1.8 | 21 |
| Cinquefoil | Potentilla | 41 | 17% | 2.4 | 29 |
| Boxwood | Buxus | 39 | 19% | 2.1 | 89 |
| Spiraea | Spiraea | 39 | 24% | 1.6 | 87 |
| Broom | Cytisus | 38 | 15% | 2.5 | 26 |
| Honeysuckle | Lonicera | 37 | 20% | 1.8 | 65 |
| Heather | Calluna | 33 | 17% | 2.0 | 30 |
| Bluebeard | Caryopteris | 29 | 8% | 3.5 | 24 |
| Barberry | Berberis | 28 | 16% | 1.8 | 74 |
| Beautybush | Kolkwitzia | 27 | 9% | 3.0 | 22 |
| Goldenbells | Forsythia | 25 | 16% | 1.6 | 44 |
| Andromeda | Pieris | 21 | 12% | 1.8 | 141 |
| Kerria | Kerria | 18 | 18% | 1.0 | 17 |

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